
Northwest Corner Affected Soil Removal Report

Former Rhone-Poulenc Site

Tukwila, Washington

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By:


Mr. Gary Dupuy, Project Coordinator

Date:

January 29, 2007

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NORTHWEST CORNER AFFECTED SOIL REMOVAL REPORT

Former Rhone-Poulenc Site
Tukwila, Washington

1.0 INTRODUCTION

Geomatrix Consultants, Inc. (Geomatrix) has prepared this report on behalf of Container Properties, L.L.C. (Container Properties) to present the results of soil characterization and soil removal in the northwest corner of the West Parcel (Northwest Corner), as described in the Affected Soil Removal Plan for Western Parcel Redevelopment (Work Plan) originally submitted to EPA January 24, 2006 and as revised on April 19 and June 19, 2006 (Geomatrix, 2006a, d, f). The Work Plan was conditionally approved with modification by the U.S. Environmental Protection Agency (EPA) in a letter dated May 23, 2006.

Section 1.0 of this report gives a background to the project, presents objectives of the soil characterization and soil removal, and discusses the interim cleanup level for the Northwest Corner. Sections 2.0 and 3.0 present the methodology for the Northwest Corner soil characterization and the results of the characterization. Section 4.0 discusses excavation methodology and results. Section 5.0 presents the conclusions of this report.

1.1 BACKGROUND

The former Rhone-Poulenc facility (Site) occupies about 21 acres in the City of Tukwila in an area known as Seattle's South End Industrial District. The Site has been used industrially since the 1930s. Most recently, Rhone-Poulenc, Inc. operated a vanillin manufacturing facility at the Site that was closed to manufacturing in 1991.

The current owner, Container Properties, is in the process of redeveloping the Site. The Site has been divided into two separate parcels (West and East Parcels) as described in the Western Parcel Redevelopment Work Plan (Geomatrix, 2005a). The excavated area is located in the northwest corner of the 13.15-acre West Parcel (Figure 1). As part of redevelopment, aboveground structures on the Site have been demolished and the West Parcel has been graded and redeveloped into a paved, fenced parking area, which has been leased by Insurance Auto Auctions, Inc. (IAAI).

Historic releases of hazardous substances have occurred at the Site. Released constituents include caustic soda, toluene, mineral oil, polychlorinated biphenyls (PCBs), and copper. Corrective action at the Site is covered under Resource Conservation and Recovery Act (RCRA) Section 3008(h) Administrative Order on Consent No. 1091-11-20-3008(h) (Order) between the Respondents (the current owner, Container Properties, and former operators, Rhodia, Inc., and Bayer CropScience), and EPA Region 10, dated March 31, 1993, as amended.

Soil and groundwater at the Site have been characterized in a series of investigations. Soil sampling data presented in the RCRA Facility Investigation (RFI) Report (CH2M HILL, 1995) identified an area with elevated copper concentrations in the Northwest Corner of the Site. A soil sample collected at location A01-04 at a depth of 6 inches was found to be affected by copper at a concentration of 6,850 milligrams per kilogram (mg/kg). Soil affected with this concentration of copper could release the contaminant to the sensitive habitat along the Duwamish Waterway. The approximate location for soil sample A01-04 is shown on Figure 1; this location is outside the interim measure barrier wall. The sample location for A01-04 was plotted based on survey coordinates reported in the RFI Report (CH2M HILL, 1995), and placed on the most recent survey map for the Site (Barghausen, 2006).

The Dames and Moore Site Investigation Report (Dames and Moore, 1986), the RCRA Facility Assessment (PRC, 1990), and the Landau Site Assessment Report (Landau, 1991), are the primary documents that discuss historical operations. The location of sample A01-04 was identified in the Landau report as being a “disposal location most likely used by the former POW encampment,” which was present on site in 1946. The RCRA Facility Assessment designates this area as the “north surface storage area” and indicates that equipment and other items were stored on open ground beginning in about 1954. Figure 2-3 of the Dames and Moore report shows that the closest former potential contamination source to A01-04 was the “Incinerator Location (abandoned)” located on the adjacent property to the north. An area identified as the “Autoclave Solids Dumping Area” is located 200 to 400 feet east-northeast of the A01-04 sample location on the neighboring property to the north. It is not known how the soil with elevated copper concentration relates to past disposal practices. No other specific potential sources of copper noted in the soil sample from location A01-04 were identified. The actual source of contamination at the sample location is unknown.

This report summarizes soil characterization and removal activities conducted in the Northwest Corner of the West Parcel, where past sampling for copper identified an elevated concentration,

and where historical sampling data were not sufficient to fully characterize the nature and extent of contamination.

1.2 OBJECTIVES

The objective of this soil characterization and voluntary interim measure was to further define and remove surficial soil contamination greatly exceeding the Model Toxics Control Act (MTCA) Method B interim cleanup level for copper within the Northwest Corner of the West Parcel as an Interim Measure pursuant to Section VI.A of the Order. The area of affected soil is described in Section 4.0. The scope of work included the following:

- Conduct soil sampling as specified in the Work Plan;
- Collect soil samples to confirm the extent of copper-affected soils in the Northwest Corner of the West Parcel outside the barrier wall;
- Prepare homogenized multi-incremental soil samples for copper analysis;
- Remove soil with elevated copper concentrations; and
- Backfill the excavation with clean soil.

Details concerning this work are presented in this report. The interim cleanup level for copper in soil established in the approved Work Plan is 36.4 mg/kg, which is based on Puget Sound background copper concentrations. Copper concentrations in much of the soil within the West Parcel exceed the Puget Sound background levels (Ecology, 1994); the primary goal of this interim measure was to remove surficial soil substantially exceeding the interim copper cleanup level.

As noted above, the only interim cleanup level established in the Work Plan was for copper in soil. This interim cleanup level, which was established primarily for surface soil subject to erosion, was based on an assumed unrestricted land use scenario; actual land use for the West Parcel is industrial. As noted in this report, suspected waste material potentially contaminated by petroleum hydrocarbons, semivolatile organic compounds (SVOCs), and metals other than copper was identified during the investigation. Therefore, cleanup criteria for additional constituents were needed to evaluate characterization results and to assess interim action needs. Interim cleanup criteria were established for these additional soil constituents. The interim cleanup criteria are intended only for use in the interim measure for the Northwest corner described in this report.

Since the interim measure described in this report included removal of surface soils over nearly the entire project area and deeper soils are not subject to erosion, the additional cleanup criteria have been established assuming industrial land use, and apply only to soils deeper than 1 to 2 feet below grade. It should also be noted that the area addressed by this interim measure has been completely paved with asphalt. The additional interim cleanup criteria developed for this interim measure are based on MTCA Method A industrial soil cleanup levels or, for constituents with no Method A cleanup level, the MTCA Method C cleanup levels. The methodology used to establish the interim cleanup criteria included protection of groundwater, assuming groundwater criteria were based on ambient surface water quality criteria. The interim cleanup criteria were established using Washington Department of Ecology (Ecology) tools: risk-based criteria and parameters were obtained from Ecology's Cleanup Levels and Risk Calculation (CLARC) website (Ecology, 2006a), and protectiveness of groundwater was assessed using the MTCASGL-10 spreadsheet (Ecology, 2006b); subsequent to calculating interim cleanup levels for the Work Plan, Ecology has issued a revised spreadsheet, MTCASGL-11. The interim cleanup criteria are presented later in this report.

2.0 CHARACTERIZATION METHODOLOGY

As outlined in the Work Plan, the Northwest Corner soil characterization approach was based on collection of multi-incremental samples. This approach requires collecting 30 or more grab samples throughout the area of interest and analyzing homogenized, composite samples for constituents of concern. Based on discussions with EPA, the multi-incremental sampling approach is considered more representative of areas with no known source of hazardous constituents.

Characterization methods were performed in general accordance with the Work Plan (Geomatrix, 2006f), with few exceptions. These deviations from the Work Plan are identified in the following sections. Section 2.1 presents the rationale for the Northwest Corner soil characterization. Section 2.2 describes field preparation for the soil characterization. Sections 2.3 and 2.4 describe characterization sample collection and preparation methods, respectively. Section 2.5 presents decontamination and disposal methods, and Section 2.6 discusses analytical methods for characterization samples.

2.1 CHARACTERIZATION APPROACH

Since copper was historically detected in Northwest Corner soil at concentrations exceeding the interim cleanup level, copper was the focus of the investigation. A multi-incremental sampling approach was used to determine the extent of the copper-affected soil near soil sample location A01-04. Originally, 35 boring locations were planned for sampling. However, because visible evidence of copper contamination (green soil) was noted in the field while collecting samples from the western borings, seven additional borings were installed to the west and southwest of the planned extent of investigation. These borings were added after consultation with EPA staff. Figure 1 shows the locations of the 42 soil sample locations within an area measuring approximately 55 feet long by 20 feet wide around sample location A01-04, extending from the northern property fence to the barrier wall to the south. As specified in the Work Plan, samples were collected at depths of 0.5 to 1.0 feet, 2.0 to 3.0 feet, and 5.0 to 6.0 feet within this area using direct-push drilling methods. These sample depth intervals represent three separate “surfaces” that were characterized within the area of investigation.

2.2 FIELD PREPARATION

On June 1, 2006, Geomatrix staff staked sampling locations in the field. Field preparation performed prior to characterization sampling consisted of the following steps:

- Locate two control points at known locations using a Trimble GeoXT Global Positioning System (GPS). This system is capable of determining positions within 3 feet using a U.S. Coast Guard radio beacon correction. The control points were compared with recent survey coordinates to verify that the GPS datum was the same as the pre-existing horizontal site survey datum (Washington State Plane North, North American Datum of 1927 [NAD27]).
- Determine the coordinates of the corners for the investigation area from the base map using AutoCAD. On June 1, 2006, Geomatrix staff located the corners of the sample area using a Trimble GPS unit using the NAD27 coordinate system.
- Measure out the proposed 35 sample locations using the corners of the investigation area. Stakes were placed to designate the planned 35 sample locations.
- Perform a public (One-Call) utility locate to identify utilities in the investigation area (ticket number 6170796).

2.3 CHARACTERIZATION SAMPLE COLLECTION

Between June 2 and June 5, 2006, Geomatrix staff collected soil samples from 42 locations within the investigation area. When suspected “waste” material (as defined in the Work Plan) was encountered at a specified multi-incremental sampling depth, the borings containing suspected waste were sampled but not included in the compositing. Suspected waste was identified in three borings at the defined multi-incremental sampling depth. Therefore, each multi-incremental composite sample for a specific depth was prepared from 39 individual samples collected at the specific depth. Photographs of the sampling process are included as Appendix A.

At each of the 39 composite sampling locations, samples were collected from three depth intervals, or “surfaces.” The 39 soil samples from each depth specified in Table 1 were used to prepare a single, multi-incremental, composite sample for each of the three surfaces. At every boring, duplicate or “archive” samples were collected from each surface, producing 39 archive samples per surface (117 archive samples total).

The sample location numbering system that was implemented in this investigation consisted of “NWC-,” then surface number (i.e., “1-,” “2-,” or “3-” with increasing depth), then sample

location (i.e., “1” to “42”). As an example, the fifteenth sample location from the second surface was labeled as “NWC-2-15.” The archive sample from this location was labeled as “NWC-2-15A.”

Sample collection proceeded as follows:

- A direct-push drill rig from Cascade Drilling, Inc. (Cascade), of Woodinville, Washington, was on site during soil sampling. The sampling team included at least two Geomatrix staff members and one Cascade representative. Drilling and soil sampling were supervised by Zanna Satterwhite, a Geomatrix Project Geologist licensed in Washington State.
- A 2-inch direct-push probe with acetate liners was used to perform continuous soil sampling to the maximum desired depth at each sample location, as specified in Table 1. The core samplers were 3 feet in length. The direct-push sample cores and rods were removed and then reinserted into the same borehole in order to collect deeper soil samples.
- For each boring at the specified sample depth, a portion of soil (with gravel, if present) was scraped evenly from the designated sample depth interval into a pre-cleaned 2-ounce jar, and was labeled with the date, time, sample location, sample number, and sampler’s initials.
- An archive sample was collected from every target depth into another pre-labeled, pre-cleaned 2-ounce jar, and was labeled with sample location. Archive and composite samples were placed in separate iced coolers. The archive samples were eventually stored at the analytical laboratory pending future analysis.
- Sampling proceeded until field observations indicated the sampling had encompassed affected surface soil; a total of 39 composite and 39 archive samples were collected for each surface.
- The Project Geologist noted changes in sampling methods caused by sampling difficulties; field observations and sample locations were recorded in the field book. Borings were not lithologically logged.

Soil cores recovered from each sampling location were inspected for visual or olfactory evidence of suspected waste materials, such as oily or discolored deposits or deposits consisting of materials other than soil. When evidence of potential waste or suspected contamination was encountered within a soil core, the following procedures were implemented:

- EPA project staff were notified verbally or by email that potential waste or potential contamination was identified.

- The location was recorded in the field book for the likely presence of suspected waste or contamination, along with a description of observations.
- A sample of the suspected waste or contamination was collected for more detailed analysis to attempt to characterize the nature of the potential waste material. Samples of suspected waste or contaminated soil were labeled with “W” (e.g., “NWC-1-22W”); the surface identifier was assigned based on the surface nearest the depth where the suspected wastes sample occurred.
- Suspected waste samples were kept in iced coolers separate from the composite and archive samples.
- The direct-push sampler was decontaminated prior to collecting any further samples.
- Multi-incremental sampling was resumed at the next sample location, taking care to check the sample core for evidence of waste materials or contaminated soil.

Suspected waste samples were collected from 11 boring locations. The drill rig rods and sampling equipment were cleaned prior to conducting any borings. As noted above, when suspected waste materials or suspected contaminated soil was encountered in a boring, the drilling equipment was decontaminated between sampling points. As described in the Work Plan, drilling equipment was not decontaminated between samples with no obvious signs of contamination or suspected waste.

Soil sample jars were segregated into three different coolers in the field – (1) samples to be composited as multi-incremental samples; (2) archive samples; and (3) suspected waste or suspected contaminated soil samples. Separate chain-of-custody forms were filled out for each of the three coolers.

All samples were labeled with the sample number, depth, date and time of collection, and sampler’s initials. The samples were stored in coolers with water ice and kept cool. All samples were delivered to Columbia Analytical Services (CAS) laboratory in Kelso, Washington. Standard chain-of-custody procedures were followed using chain-of-custody forms for all samples sent to the laboratory.

On June 16, 2006, Geomatrix staff used a GPS unit to survey the approximate coordinates of the unplanned boring locations in the Northwest Corner.

2.4 CHARACTERIZATION SAMPLE PREPARATION

The multi-incremental sampling approach relied on homogenization of the sample to ensure that the multi-incremental sample was representative of the sampling surface for each investigation area. Homogeneity was achieved at the laboratory by grinding the entire multi-incremental sample to finer size using specialized grinding equipment, and thoroughly mixing the resulting fine-grained material using the following procedures:

- Prior to analysis, each multi-incremental grab sample was prepared by air-drying and grinding the entire multi-incremental grab sample, followed by thorough mixing to homogenize the multi-incremental composite sample. Each grab sample was ground to less than approximately 0.125-inch particle size (#10 sieve medium sand) using a “shatter-box” ring mill composed of hardened steel, as described in the Soil Sampling Quality Assurance Project Plan (QAPP) for the Former Rhone-Poulenc Site (Geomatrix, 2006e). The shatter-box components were decontaminated between samples from different surfaces by washing with deionized water.
- After crushing and grinding each multi-incremental grab sample to a consistent grain size, individual samples for a specified depth were composited into a single multi-incremental sample for that depth so that three multi-incremental composite samples were analyzed. Mixing of each multi-incremental composite sample was done thoroughly prior to analysis using a decontaminated stainless steel spoon or spatula.
- The multi-incremental composite sample was then split into soil aliquot(s) to fill the required sample jar for the analyses. One aliquot of each multi-incremental composite sample was analyzed for copper.
- Composite sample labeling followed the naming scheme in Table 1. The shallow multi-incremental composite sample was labeled “NWC-1,” the middle sample was labeled “NWC-2,” and the deepest sample was labeled “NWC-3.”

Note that discrete and archive samples were not ground or composited prior to analysis.

2.5 DECONTAMINATION

The characterization soil sampling equipment was decontaminated using a three-step wash/rinse cycle. Water containing a dilute solution of Alconox was sprayed onto the sampling spoons and scrubbed with a brush. Overspray and drippings were contained in a 5-gallon polyethylene bucket. A second spray of Alconox solution was used to remove soil from the sampling equipment. A third spray of deionized water was used to rinse the equipment.

All clean sampling equipment not intended to be used immediately was wrapped in a layer of aluminum foil to minimize inadvertent recontamination. The decontamination fluids in the bucket were decanted from the solids and treated using the existing on-site purge water disposal system following methods specified in the Revised Operation, Monitoring, Inspection, and Maintenance Plan for the Hydraulic Control Interim Measure (HCIM) (Geomatrix, 2006b). The soil cuttings were contained in 5-gallon buckets. On July 28, 2006, Envirotech Systems, Inc., of Lynnwood, Washington, picked up six 5-gallon drums of soil generated by characterization soil sampling. Prior to off-site transport, the buckets were transferred into a 30-gallon drum. Manifests and disposal tickets for this soil are included in Appendix B.

2.6 ANALYTICAL METHODS

Tables 1 through 4 list the analyses performed for soil samples collected during the Northwest Corner soil characterization. All Northwest Corner soil characterization samples were collected, processed, and analyzed in general accordance with the QAPP and the Work Plan (Geomatrix, 2006a, d, e, f). Analytical methods were selected to ensure that reporting limits were lower than the interim cleanup levels.

The aliquot extracted for copper analysis by EPA Method 6000/7000 consisted of a minimum of 1 gram of the homogenized, multi-incremental soil sample.

Multi-incremental sample analyses were limited to copper, which was defined in the Work Plan as the constituent of concern for the Northwest Corner. The analytical results for each multi-incremental sample were compared to the interim soil cleanup level to determine if the surface represented by the sample was contaminated by copper. If the multi-incremental sample concentration was greater than the interim cleanup level, then selected archive samples were analyzed for copper to more precisely delineate the area of contamination. The archive samples were not ground prior to copper analysis.

Suspected waste samples were collected from 11 borings. Selected suspected waste samples were analyzed for SVOCs, total petroleum hydrocarbons-hydrocarbon identification (TPH-HCID), TPH as diesel extended (TPH-Dx), TPH as gasoline (TPH-G), and/or metals. Selection of suspected wastes samples to be analyzed was based on field observations of parameters such as color, odor, sheen, and photoionization detector (PID) readings. The analyses selected for the suspected waste samples are shown on Tables 3 and 4.

In accordance with the QAPP, analytical data were reported with a standard laboratory data and quality control package. In addition, the laboratory provided written certification stating that the sample grinding and homogenization were performed in accordance with the standard operating procedure included in the QAPP. Quality Control (QC) measures and laboratory deliverables for the soil characterization sampling are described in Section 3.3.

3.0 SOIL CHARACTERIZATION RESULTS

Results for the soil characterization laboratory testing are shown in Tables 1 through 4 and Figures 2 through 4. Evidence of suspected waste (i.e., green coloration, abnormal behavior, odor/sheen indicative of TPH) was observed in 20 borings. In three borings, the depth of suspected waste coincided with multi-incremental sampling depths: NWC-X-2, NWC-X-12, and NWC-X-39 (Figures 2 through 4). Therefore, in accordance with the Work Plan, samples from these three borings were not included in the composites. Figures 2 through 4 show sample locations for each of the three sampling surfaces, with color-coded icons denoting field observations. Table 1 presents composite characterization soil sample results for the Northwest Corner investigation. Tables 2 through 4 and Figures 2 through 4 show discrete characterization soil sample results for surfaces 1, 2, and 3. The discrete sample analyses allowed for more precise delineation of copper-contaminated soil.

3.1 FIELD OBSERVATIONS

During the soil characterization fieldwork, evidence of contamination, including green coloration, viscoelastic soil behavior, odor, and sheen was noted in some borings. Green-colored soil was mainly observed in the upper 2 feet. Viscoelastic behavior was noted below the green-colored soil at three of the borings. This material exhibited a “silly-putty”-like flow, and was a beige color (see photos in Appendix A). Hydrocarbon odors and sheen were encountered between 2 and 5 feet below ground surface (bgs) in some of borings in the northern and southwestern portions of the investigation area (Figures 2 to 4). PID detections were noted in these areas as well, with headspace readings of up to 478 parts per million (ppm) measured in boring NWC-X-25.

3.2 ANALYTICAL RESULTS

The three composite samples from the Northwest Corner were analyzed for copper. Copper in composite soil samples from the upper two surfaces, NWC-1 and NWC-2, exceeded the copper interim cleanup level of 36.4 mg/kg (Table 1). The lower surface composite sample, NWC-3, contained a detectable level of copper, but the measured concentration was less than the interim cleanup level. Because Surface 1 and Surface 2 composite copper results exceeded the copper interim cleanup level, discrete archive samples from these surfaces were analyzed for copper to more precisely define the extent of contamination; selected archive samples were analyzed for Surface 1, and all 39 archive samples were analyzed for Surface 2.

Analytical results from the discrete soil samples selected for copper analysis are presented in Table 2. Analysis of discrete samples showed that copper exceeded the interim cleanup level in all Surface 1 archive samples that were analyzed and in 19 of 39 Surface 2 archive samples. These results are also shown on Figures 2 and 3 for Surfaces 1 and 2, respectively.

Suspected waste samples were collected from 11 borings during the soil characterization. Samples were selected for laboratory testing based on field observations. Selected suspected waste samples were analyzed for TPH-HCID, TPH-Dx, TPH-G, SVOCs, and/or metals. Since interim cleanup levels had not been established for these constituents, MTCA Method A cleanup levels for industrial sites were used as the primary source of cleanup criteria. For constituents with no MTCA Method A industrial cleanup level, Method C soil cleanup levels protective of groundwater were calculated using the MTCA spreadsheet MTCASGL-10 (Ecology, 2006a). The site-specific soil organic carbon fraction (0.256 %) was used for the calculation. Other parameters needed for MTCASGL-10 calculations, including ambient water quality criteria which were used as groundwater criteria, were obtained from the Ecology CLARC web site. The MTCASGL spreadsheets are appended to this report (Appendix E).

Gasoline range organics (GRO) were detected above the MTCA Method A cleanup level of 100 mg/kg in six of seven suspected waste samples analyzed for GRO, with a maximum concentration of 13,000 mg/kg in NWC-2-6W (Table 4). Diesel range organics (DRO) were detected slightly above the interim cleanup level of 2,000 mg/kg in one of the six suspected waste samples analyzed for DRO, at a concentration of 2,100 mg/kg (in NWC-2-36W). Copper was found at concentrations exceeding the interim cleanup level of 36.4 mg/kg in all four suspected waste samples analyzed for metals, with a maximum concentration of 18,200 mg/kg in NWC-2-39W (Table 3).

Pentachlorophenol (PCP) was the only SVOC detected at a concentration that exceeded interim cleanup levels in the soil characterization samples. PCP was detected in sample NWC-1-22W (1.0 to 1.5 feet in depth) at a concentration of 550 µg/kg, above the MTCA Method C interim cleanup level for PCP of 270.2 µg/kg.

3.3 QUALITY CONTROL

A data quality review was performed for all analytical data. Copies of the analytical and associated data quality review reports are included in Appendix C. The data quality review was based on method performance and QC criteria, as specified in the Work Plan and QAPP

(Geomatrix, 2006d, e, f). Hold times, initial and continuing calibrations, method blanks, surrogate recoveries, laboratory duplicate results, matrix spike/matrix spike duplicate (MS/MSD) results, and reporting limits were reviewed to assess compliance with applicable methods and project requirements. If data qualification was required, data were qualified in general accordance with the definitions and use of qualifying flags outlined in EPA documents (EPA, 1999, 2004). Assigned qualifiers are included with the data sheets. No data were rejected. Based upon the QC review, the data are acceptable and meet the project objectives.

Field duplicates were not collected. The Work Plan specified that one equipment blank be collected from analyte-free deionized water poured into the shatter-box ring mill after all the multi-incremental samples had been processed, sample aliquots collected, and equipment decontaminated. The laboratory did not collect the equipment blank sample. However, the laboratory has certified that they completed decontamination of the shatter box between samples in the manner specified in the Work Plan.

4.0 EXCAVATION AND DISPOSAL

Based on the results from multi-incremental sampling and the Work Plan, affected soil requiring removal was identified from grade to a depth of 5 feet where the Surface 3 multi-incremental composite sample indicated that soil met the interim cleanup level for copper. As discussed in Section 3.2, some of the soil within the investigation area was also contaminated with GRO, DRO, and polycyclic aromatic hydrocarbons (PAHs) at concentrations that exceeded MTCA Method A or Method C Cleanup levels. The copper-affected soil identified by multi-incremental sampling was removed from the Northwest Corner in general accordance with the Work Plan. The following subsections describe the excavation and disposal approach for the Northwest Corner.

4.1 SOIL EXCAVATION

As noted previously, analytical results for the multi-incremental composite samples indicated that Surfaces 1 and 2 exceeded the interim cleanup level for copper. Surface 3, at a depth of 5 feet, was characterized as meeting the interim cleanup level for copper; therefore, it was determined that soil within the Northwest Corner investigation area required excavation to 5 feet bgs. The Surface 1 multi-incremental composite sample was substantially above the interim cleanup level while the Surface 2 multi-incremental composite sample was an order of magnitude lower in concentration. Thus, it was concluded that soil excavated to a depth of 2 feet (i.e., to Surface 2) required off-site landfill disposal; due to lower contaminant concentrations, soil excavated from a depth of 2 feet to 5 feet was determined to be acceptable for use as fill within the areas in the West Parcel with known contamination and that are enclosed by the subsurface barrier wall.

The results from analysis of discrete, archive samples from Surfaces 1 and 2 were used to identify the area to be excavated. As shown by the data of Table 2 and Figure 2, the archive samples selected from Surface 1 for analysis were all above the interim cleanup level. All archive samples for Surface 2 were analyzed for copper; these results were used to identify the areal extent of the excavation. The results of the Surface 2 archive sample analyses are shown on Figure 3. The eastern boundary of the excavation was established west of borings NWC-X-11 and NWC-X-34 and east of boring NWC-X-14; the Surface 2 archive sample results from these borings were all below the interim cleanup level. The excavation area was extended to the south from boring NWC-X-42 based on field observations during excavation; the excavation was terminated north of Well MW-39 to avoid adverse effects on the well.

Analysis of soil samples collected during installation of Well MW-39 in 2002 indicated that soil at this location was affected by several TPH constituents (URS, 2002). Contamination in the area south of the excavation will be addressed in the final Corrective Measures Study for the West Parcel. The excavation was constrained to the north by the property line, to the south by the barrier wall and Well MW-39, and to the west by the embankment along the Duwamish Waterway. The final areal extent of the excavation is shown on Figure 5. Field observations during the excavation (discoloration and odor) indicate that soil affected by TPH may extend to the north of the excavation, beyond the property line.

The entire investigation area was excavated to a depth of 5 feet bgs (to Surface 3). The top 2 feet of soil from the entire excavation (i.e., soil between Surfaces 1 and 2) was excavated and placed in a soil stockpile located on the East Parcel; this stockpile was disposed of off site. During excavation, field observations showed evidence of contamination by TPH or waste materials below 2 feet bgs in four areas, as shown in Figure 5. The northwest corner of the excavation (Area I on Figure 5) showed green discoloration and viscoelastic material down to approximately 5 feet. In addition, the north area surrounding historical sample A01-04 (Area II), the southeast corner (Area III), and the southwest area (Area IV) all showed evidence of TPH contamination by petroleum hydrocarbons, as evidenced by dark staining and odors. These areas were excavated to 5 feet bgs with the material placed in the stockpile for off-site disposal. Remaining soil from 2 to 5 feet was excavated and placed in the contained area inside the barrier wall. This soil (approximately 54 cubic yards) was placed at the location shown on Figure 6 (Grid D-6). Soils known to be contaminated by TPH or SVOCs were stockpiled for offsite disposal and were not placed inside the contained area.

Photographs of the excavation process are included as Appendix D. The extent of the excavation was constrained due to the barrier wall and well MW-39 to the south, the fence line and embankment to the west, and the property/fence line to the north. The lateral and vertical extent of the excavation was based on analytical data for copper and field observations of staining or odor. Known soil contamination in the upper 5 feet was excavated from the Northwest Corner. As noted by Figures 2 and 3, the full extent of soil affected by TPH to the west and south has not been determined. Field observations indicate that TPH-affected soil appears to remain to the north of the excavation, which extends to the north property line (Figure 5).

The off-site disposal stockpile area was constructed by Glacier Environmental, Inc. (Glacier) with a minimum 8-inch berm on all sides. Photos of the stockpile are included in Appendix D. The stockpile was lined and covered with 10 mil UV-resistant plastic sheeting. The stockpile was maintained until stockpiled soils were shipped for off-site disposal.

While conducting the excavation, a wooden piling encased in concrete and approximately 2 feet in diameter was encountered near the west edge of the excavation. This object was observed approximately 1 foot bgs (see photos in Appendix D). The pile dipped downward to the west and the eastern end of the concrete ended inside the excavation. The wood pile appeared to have been treated with creosote and exhibited the characteristic creosote odor. Soil was excavated from around the object, which was left in place.

In the area around boring NWC-X-39, many flat concrete chunks between 1 and 4 feet long were encountered between 2.5 and 5.5 feet bgs. In the same area, there was viscoelastic material, green and cerulean-colored soil, brick chunks, glass chunks, and wood debris. Debris present within excavated soil around boring NWC-X-39 was placed in the stockpile for off-site disposal.

A total of about 172 cubic yards of soil was excavated from the Northwest Corner. Of this volume, about 54 cubic yards was placed within the West Parcel, with the remainder (about 118 cubic yards) transported to the Rabanco transfer station for disposal in the Roosevelt landfill, as discussed in more detail in Section 4.2.

The excavation was backfilled to grade with clean sand fill obtained from the foundation of the former warehouse building (Figure 6). A large quantity of clean sand was exposed beneath the floor of this building when it was demolished. This material was sampled (two randomly located grab samples) and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), SVOCs, copper, and TPH-HCID. Analytical testing of the sand samples revealed detectable levels only of fluoranthene (at concentrations ranging from not detected to 96 $\mu\text{g/kg}$), pyrene (at concentrations ranging from not detected to 96 $\mu\text{g/kg}$), and copper (at concentrations of 15 to 19 mg/kg); all other analytes were below reporting limits. The detected PAHs (fluoranthene and pyrene) are not listed as carcinogenic, and concentrations are well below the calculated MTCA Method C interim cleanup levels. The sand was placed into the excavation in lifts approximately 8 to 12 inches thick, and compacted to approximately 90% of the maximum

density using a vibratory roller. Potable water from the on-site fire hydrant was added to the sand to improve compaction.

Excavation, stockpiling, and backfilling of the soil were completed on July 20 and 21, 2006. Hazardous Waste Operations and Emergency Response (HAZWOPER)-trained staff from Glacier, under subcontract to Geomatrix, performed the work. All excavation work was performed under the direct supervision of Geomatrix staff. A tracked excavator was used for the excavation. Excavated soil was placed directly into a dump truck to contain the soil and prevent releases to adjacent soils. The truck transported the excavated soil to the designated location, either the stockpile for off-site disposal or the designated location within the contained area. The excavation was conducted in accordance with the Site Health and Safety Plan and the existing Stormwater Pollution Prevention Plan (Geomatrix, 2006c). The excavation was periodically sprayed with potable water to control dust generation.

4.2 DISPOSAL

Excavated soil was disposed of in accordance with applicable regulations. Based on the characterization samples, no constituents were identified at concentrations that could cause the soil to be classified as a dangerous waste under Ecology regulations (WAC 173-303).

Characterization sample results and a waste profile were submitted to Rabanco. Based on the TPH results, Rabanco requested analysis for VOCs. Four grab samples were collected from randomly selected locations within the stockpiled soil and analyzed for BTEX by EPA Method 8021. The detected compounds included benzene (maximum concentration of 0.076 mg/kg), toluene (maximum concentration of 1.2 mg/kg), ethylbenzene (maximum concentration of 22 mg/kg), and xylene (maximum concentration of 128 mg/kg). These results were subsequently submitted to Rabanco and the soil was accepted for disposal in the Roosevelt landfill.

On October 2 and 3, 2006, the soil stockpiled for off-site disposal was transported to the Rabanco transfer station for transportation and disposal at the Roosevelt landfill. The redevelopment contractor, Engineering/Remediation Resources Group, Inc. (ERRG), loaded the soil onto lined trucks for transport to the transfer station. Documentation for soil disposal is included in Appendix B. Soil placed within the contained area of the West Parcel was graded and paved by early October 2006.

4.3 DEMOBILIZATION

Upon completing backfilling of the excavation, the excavated area was rough-graded to match the existing grade. The excavation was done in a manner that minimized contact of equipment with contaminated soil. The excavator remained outside the excavation throughout the excavation. After completing excavation, the excavator bucket was decontaminated by removing soil using a broom, with any removed soil falling into the excavation. After completing shipment of stockpiled soil from the East Parcel, ERRG removed the plastic liner and berms. The liner was placed into the trucks for disposal with the excavated soil.

5.0 SUMMARY AND CONCLUSIONS

A total of approximately 172 cubic yards of affected soil was excavated from the Northwest Corner of the West Parcel. Most of this soil was contaminated by copper and some by petroleum hydrocarbons (TPH) and PCP. Some suspected waste material was also identified and excavated. Of this volume, about 54 cubic yards of soil affected mainly by copper was placed within the barrier wall area and the remainder was sent to the Rabanco Roosevelt landfill. The removal action was successful in removing highly affected copper-bearing soil from the area and in eliminating this source area. Some excavated soil that is above the interim cleanup level for copper (i.e., the regional natural background concentration defined by Ecology) could remain on site within the contained area, but is covered with clean soil and/or an asphalt parking lot. In addition, hydrocarbon-affected soil in this area remains and has not been fully characterized.

Based on the information presented in this report, the following conclusions are made:

1. The characterization approach from the approved Work Plan has adequately characterized soils in the Northwest Corner. Multi-incremental sampling, as supplemented by analysis of the discrete archived samples, has proven effective to characterize the affected soil, provide confirmation samples, and support waste profiling for excavated soil.
2. Copper-affected soil in the Northwest Corner of the former Rhone-Poulenc facility that substantially exceeds the interim soil cleanup level based on unrestricted land use has been removed from the project investigation area. The most highly contaminated material has been transported for off-site landfill disposal; soil with nominal levels of contamination have been placed onsite, within the contained area.
3. Excavated soil has been managed in accordance with applicable regulations.
4. No further action is necessary to address copper contamination in the Northwest Corner of the former Rhone-Poulenc site.
5. Soil affected by low concentrations of TPH remains in areas adjacent to the excavation completed in the Northwest Corner. It appears that soil affected with petroleum hydrocarbons is present on the former Paccar property to the north of the former Rhone-Poulenc site.

6.0 REFERENCES

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